What is Claimed:

1. A barrel shifter comprising:

a first multiplexer stage having input terminals for receiving 32-bit input data and producing first rotated data by rotating the input data by a selectable number of either 0, 1, 2, or 3 bits responsive to first and second control signals (C0, C1);

a second multiplexer stage coupled to the first multiplexer stage for receiving the first rotated data output from the first multiplexer stage and producing second rotated data by rotating the first rotated data by a selectable number of either 0, 4, 8, or 12 bits responsive to the third and fourth control signals (C2, C3);

a third multiplexer stage coupled to the second multiplexer stage for receiving the second rotated data from the second multiplexer stage and producing third rotated data by rotating second rotated data by a selectable number of either 0 or 16 bits responsive to first, second, third, fourth, fifth, and sixth control signals (C0, C1, C2, C3, C4, CMODE), wherein for one value of the sixth control signal, the fifth control signal determines the rotation, while for the other value of the sixth control signal, the first, second, third, and fourth control signals determine the rotation individually for each bit.

2. A device for half-word alignment in a $2^n$-bit barrel shifter comprising:

a multiplexer stage receiving $2^n$-bit data from a barrel shifter stage and producing output data with individual bits selectively rotated by 0 or $2^{n-1}$ bits depending on the position of the individual bit in the $2^n$-bit data and on control signals indicating the rotation amount and whether the data size of the input data to the barrel shifter is $2^n$ or $2^{n-1}$-bits.

3. A method of rotating either a single 32-bit data word or two 16-bit data words, comprising:

receiving 32 bits of input data;

uniformly rotating the input data by 0, 1, 2, or 3 bits to produce first shifted data;

uniformly rotating the first shifted data by 0, 4, 8, or 12 bits to produce second shifted data; and

selectively rotating individual bits of the second shifted data by 0 or 16 bits, depending for 32-bit data word input on the amount of the shift desired and for two 16-bit data words input on the amount of the shift desired and the position of the individual bit within the data word.

4. A method of rotating a $2^n$-bit data word or two $2^{n-1}$-bit data half-words, comprising:

receiving $2^n$ bits of input data;

uniformly rotating the input data by 0 to $(2^{n-1} - 1)$ bits to produce first shifted data; and

selectively rotating individual bits of the first shifted data by 0 or $2^{n-1}$ bits, depending for $2^n$-bit data word input on the amount of the shift desired and for two $2^{n-1}$-bit data words input on the amount of the shift desired and the position of the individual bit within the data word.

5. A method of operating a $2^n$-bit barrel shifter to rotate two $2^{n-1}$-bit data words comprising:

selectively rotating individual bits of the two $2^{n-1}$-bit data words by 0 or $2^{n-1}$ bits, depending on the amount of the shift desired and the position of the individual bit within the data words.